

Piaggio Avanti – jet-like speed on turboprop fuel flows with the comfort of a wide-body.



**M**y first look at the Avanti occurred in the early 1990s at what was then Toronto Island Airport as it shared the ramp, fortuitously, with a Beech Starship.

The future look of aviation! Both machines attracted a lot of attention that day but, for me, the stylish and sleek looking Avanti stole the limelight.

Every once in a while fate smiles on you and, with the UAE's Mubadala now owning a major share in the Italian manufacturer, I was invited to fly the P 180 Avanti II as it toured the UAE on demo flights.

Sitting there on the apron, the unusual configuration with forward nose-mounted wing and aft-facing wing-mounted Pratt and Whitney PT6 turboprops, the Avanti II still attracts plenty of attention. It's routine for the flight crew to remove the static wicks normally fixed to the forward wing to avoid damage from curious onlookers as they strain to see into the flight deck from the front of the aircraft.

While waiting for flight clearance from the authorities, I had a chance to discuss the Avanti and its design features with pilot Lorenzo Villi and sales director for Piaggio, Fabio Sciaccia.

The design objective for optimum performance and efficiency began by calling for a mid fuselage-mounted wing and, in order to have a reasonable cabin size, the wing needed to be located as far aft as possible. The clever team at Piaggio then added the forward wing for lift and to balance the aircraft laterally, which allowed for a lift generating tail-plane in opposition to the normal down-force required from the stabiliser on conventional aircraft.

The resulting three lifting surface design allows the main wing to be smaller by 34 per cent, with inherent savings in weight and drag penalties.



Fabio pointed out that the forward wing is not a canard, as it does not move to control the pitch of the aircraft – this being accomplished conventionally by the elevator on the aft horizontal stabiliser. The forward wing is, however, set at a pitch angle that achieves stalled condition prior to the main wing and results in the required pitch down for stability. It is also equipped with flaps that extend in conjunction with the main wing flaps to retain optimum balance and the stall first ability. Proper function of the flaps and indicators is an important part of the pre-flight process.

Aiding in the sleek design is the novel manufacturing process of the fuselage, made 'from the outside in!' Piaggio's innovative process utilises a vacuum pressure rig to hold the outer fuselage panels in place while the internal structures are then riveted to the panels. The result is an almost seamless finish best suited for efficient airflow.

Gates Learjet was involved in the initial design work for the P 180 and some recognisable

features are evident as we walk out to the aircraft and begin conducting the pre-flight checks.

Externally, the large ventral fins below the tail-plane for yaw stability appear Lear influenced. In the cockpit the same entry technique as the Learjet, using the step-over the centre console method, the barrel trim switch on the control column and the cherry picker back-up manual outflow valve switch, look very familiar. Also present is the flexible side-mounted map light that is so useful for chart reading but results in that burning feeling on the forearms if left on!

The nose wheel steering through the rudder pedals is sensitive like the Lear and requires small inputs to result in smooth taxiing of the aircraft. However, the good people at Piaggio thoughtfully provided for electrically-heated windows, so there's no race against time taxiing into the FBO as your windows fog up in humid climates that Lear pilots will remember so well!

What most of us appreciated about the Learjet was lots of power and performance and the Avanti has this in abundance. The power comes from two Pratt and Whitney Canada PT6A-66B using Hartzell five-bladed, constant-speed, fully-feathering rear-facing propellers that are more than adequate for the job.

Fabio pointed out that the pusher configuration allows for undisturbed airflow over the wing, allowing for laminar flow over 50 per cent of the wing chord.

According to manufacturer information, this compares to only a maximum of 20 per cent for tractor propeller configurations and as an added bonus the propellers on the Avanti do not require anti-ice equipment as they are naturally heated by the exhaust flow from the engines! Clever.

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The engines produce 850SHP de-rated from 1630 Thermodynamic HP, which translates into full thrust available until about 20,000ft before you must manage the power to respect the ITT temperature limits.

There's no FADEC, of course, but setting the thrust manually and using the propeller synchrophase system is easy and achieves a harmonious result. The engine/propeller noise in the cockpit is muted although, in fairness, my last turboprop experience was on the MU-2 for comparison. But lightweight headsets are worn and a normal conversation level between the pilots is used.

Stepping back into the cabin where the owners and clients will be, the noise level is less than that up front on the flight deck and very comparable to current business jets.

After a spirited take-off, we are cleared out over the Gulf and I get a chance to try out the Avanti. The controls are light, well balanced and responsive, making the aircraft a pleasure to fly. In fact, manual control is used for most of the flight and is neither tiresome nor tedious in the least.

After getting comfortable, Lorenzo wishes to highlight the excellent stall and recovery capabilities of the aircraft. Thrust off and speed decreasing, the typical pre-stall buffet gives plenty of warning before the nose pitches down docilely. Recovery is made easy with plenty of thrust instantly available from the turboprop engines and the aircraft accelerates smoothly away with minimal altitude loss.

#### Maintain airflow

Lorenzo then points out that the outer portions of the main wing still maintain airflow and the ailerons are still effective throughout the stall, this being achieved with the forward wing stalling first and achieving the pitch down. He then demonstrates a second stall manoeuvre and rolls the aircraft to the left and right while maintaining the stalled condition. This remarkable feature is a big boost for the safety of the design and should give the pilot a lot of confidence in the aircraft. In fact, the stall characteristics are benign enough that the aircraft does not need either a stick pusher or stick shaker.

There is a protection in the automatic flight mode built in as well. We establish the aircraft in descent and use the vertical speed mode to keep accelerating. As the airspeed starts to exceed V<sub>mo</sub> of 260 KIAS, the autopilot mode changes to FLCH OVRD and the override function pitches the nose up to limit the exceedance. This is an excellent feature to have given the performance of the Avanti.

The aircraft is faster at typical turboprop altitudes of between 25,000 through 31,000ft, where speeds of 400 KTAS at average weights are achievable with fuel flows of 360kg/h and maximum continuous thrust, but more efficient and quiet at the higher altitude end of its performance envelope. Using recommended cruise power settings at 37,000ft the Avanti achieves a very respectable 360 KTAS at a meagre

## Piaggio spreads its wings

**Mubadala Development-backed Italian business aviation manufacturer Piaggio Aero is aggressively pushing for a rise in international sales and has taken its P.180 Avanti II on the road in the Middle East and Asia.**

**Last September the P.180 Avanti and Avanti II aircraft fleet passed 500,000 flight hours. The world fleet is composed of 203 aircraft (plus four prototypes). With its two versions, the 'Avanti', certified in 1990, and the Avanti II, certified in 2005, the P.180s had flown more than half-a-million flight hours as of September 2010.**

**Alberto Galassi, Piaggio Aero's CEO said: "The total flying hours is not just a number; it marks a milestone of steadily accumulated experience in building, operating and maintaining the most innovative, fast and environmentally green, multi utility aircraft."**

**All this makes for a compelling case for Mubadala Development, the strategic investment arm of the Abu Dhabi Government, to have ambitions to build a new jet. The financial giant has said in the past that it aims to use its stake in Piaggio to build a new business aircraft in the emirate, although it has said that the plan is not due to be rolled out until the second half of the next decade.**

**Should this take place, it would make the Emirates the first Arab country to design and build an aircraft from scratch.**

**Mubadala's aerospace business represents about 10 per cent of the company's asset base and the company owns 31.5 per cent of Piaggio Aero Industries, based in Genoa, Italy.**

**Mubadala also owns stakes in aviation entities, including manufacturing, maintenance and flight training. Its Strata Manufacturing business in Al Ain already produces composite aircraft parts for various European aerospace firms.**

**Mubadala has said that it aims to increase its role in the industry and become a Tier 1 supplier. Strata comprises 21,600sqm of manufacturing space and is due to expand to 60,000sqm in later phases, representing an investment of about \$500m.**

**Strata is the key tenant in the aerospace cluster that Abu Dhabi Airports Company is developing at Al Ain International Airport. Other Piaggio shareholders include the Tata Group of India (which also owns Taj Air) and a private investor group led by the Ferrari and Di Mase families.**

**Piaggio, too, has been planning a new aircraft for several years, likely to be a jet version of its Avanti II turboprop, in a project that could cost a reported \$1bn. However, according to past statements by Galassi the new aircraft would most probably be made in Genoa. The company remains tight-lipped over timelines, but may have a new announcement at EBACE.**

**Galassi is bullish about the prospects for Piaggio. He said: "Over the years, our unique product has allowed Piaggio Aero to become one of the most authoritative ambassadors of Italian high technology worldwide. We owe this success mainly to the extraordinary product we build, which, delivers, superior performance and an outstanding level of reliability and safety. It really represents a new frontier in executive flying."**

250kg/h. The aircraft is faster than many VLJs entering the market with a much roomier nine-place cabin. It boasts turboprop fuel flows and is at least 80 knots faster than comparable turboprops.

The flight deck is equipped with Collins ProLine 21 EFIS, and the three liquid crystal adaptive flight displays prove easy for instrument scan and intuitive to use.

The outer AFDs serve as primary flight displays with the centre unit set for multi-function use with engine indication system on the upper portion and the lower portion offering a range of options from checklists through navigation data, systems page and enhanced maps.

Weather avoidance is made easy through the use of turbulence detection radar and the aircraft is well equipped for icing conditions. Engine inlets have pneumatic boots and the venerable PT6s have their inertial particle separators. The main wing leading edge utilises engine bleed air while the forward wing has electric blankets in the leading edge.

#### No ice protection

Fabio said no ice protection is required for the rear horizontal stabiliser of vertical tail, as ice accretion does not adversely affect the tail plane to any extent. The pilot is alerted to the presence of ice by an ice detector probe that will illuminate a warning on the instrument panel.

Avanti is RVSM-capable, approved for CAT II low visibility operations, steep approaches like London City Airport and is P-RNAV-certified. All of the capability that you would expect for a corporate jet is available.

Back to hand flying the Avanti and we return for landing in Dubai. The view from the large forward windows is fantastic and I am truly enjoying the responsiveness of the flight controls and turboprop engines.

For the pilot the aircraft has a lot to offer. Firstly there is jet-like climb and cruise performance with turboprop capability for shorter take-off and landing runs at smaller airports.

The systems are easy to use; the airframe is robust and forgiving and there is a high level of confidence in the P 180 with its excellent stall characteristics and controllability. Overall there are many positives to the aircraft and the only cautions are to go easy with the nose wheel steering and turn off the map light!

Piaggio's stated goal for the Avanti is to provide jet-like speed on turboprop fuel flows while providing the spaciousness and comfort of a wide-body, stand-up cabin. For shorter-range profiles of up to two hours there is very little time advantage in the use of a jet and all the cost advantage that the fuel sipping and price conscious Avanti offers. As the cost of fuel once again climbs higher and becomes more of an operating factor, the argument for the P 180 will only strengthen. Piaggio's innovative, clever and eye-catching design should become more and more appealing with time. It certainly deserves to.